TABLE II

PER CENT. OF EACH KIND OF ILLUSION FOR EACH GROUP.
First Complete Reading

	Group		
	A	*B*	*C*
Supply of omitted letters	100	100	99
Letter-substitution	94	94	86
Word-substitution	71	46	46
Final Reading			
Supply of omitted letters	94	100	
Letter-substitution	78	94	
Word-substitution	29	38	

From a study of Table II. it is obvious that the members of group *A* are more susceptible to the illusions so far as their immediate reaction is concerned than are those in groups *B* and *C*. This is especially true with respect to the most complicated illusion, namely, word-substitution. Group *A* shows, however, a quick recovery from the illusions and a strong tendency to correction of errors on subsequent readings. Illusions involving the substitution of words are less easily set up than those involving merely letter-substitution or supply of missing letters. No reader, even on the fourth exposure, perceived every word exactly as printed. Every one, for example, inserted the "i" in "examination."

SUMMARY

Susceptibility to the proof-reader's illusion correlates with general intelligence to a considerable degree. Reagents, little intent upon meaning or with a narrow span of attention, give evidence of this in both the intelligence and the illusion test.

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REVIEWS AND ABSTRACTS OF LITERATURE

Physiological Chemistry. ALBERT P. MATHEWS. Second Edition. New York: William Wood and Company. 1916. Pp. 1040.

Normally the appearance of the second edition of a successful text in physiological chemistry does not offer matter for comment in psychological and philosophical circles. However, in the second edition of so widely used a text as Mathews's *Physiological Chemistry,* the case is different because of Professor Mathews's specula-

tions in regard to the nature of consciousness. The importance of the book in its own field renders these casual comments something to be reckoned with. I shall accordingly notice only so much of the book as is of direct interest to the philosopher or psychologist.

Professor Mathews's position is, on the whole, materialistic, but it is at best an unstable materialism which easily breaks down into a form of panpsychism in the presence of any persuasive analogy. The materialistic interpretation appears first in the chapter on "The General Properties of Living Matter." He finds the solutions which regard psychical phenomena as outside of the chain of physical causes, *i. e.*, as parallel or epiphenomenal, as most unsatisfactory, "since if consciousness has this position it becomes difficult to attack the problem as all other physical problems have been attacked" (p. 7). He hazards this prophecy: "It may prove to be the case, although the evidence is certainly not favorable at present, that consciousness, or rather the psychical basis of it, should be put together with heat, light, and electricity as one of the accompanying manifestations of energy transformations in living and, presumably, in lifeless things also" (pp. 7 and 8). Aside from the difficult feat involved in counting a "psychical basis" in the same series with forms of physical energy, as this sentence demands, it is one of the most elusive sentences that could well be penned on the subject of consciousness. For while taken in connection with the paragraph in which it belongs, it undoubtedly points to a way of viewing consciousness as a "portion of transformed energy"—certainly a materialistic conception—yet at the same time it suggests strongly a universal parallelism or a panpsychism such as Clifford's, according to which the humblest atom has its quota of "mind-dust." Quite in accord with this panpsychic view we find Professor Mathews speaking of "the physical-chemical-psychical constitution of protoplasm" (p. 6).

It is, on the other hand, the materialist speaking when Professor Mathews writes: "It is, however, very important to remember in the course of the transformation of potential into kinetic energy in living matter that the kinetic energy may appear in various forms, and that if it appears in some other form than heat, the heat which one might expect to appear does not do so, but this is replaced by light, electrical currents, movements, possibly psychic energy, if there is such a thing, or some other form of energy of movement" (p. 8).

I need only mention in passing the instructive analogy which Professor Mathews draws between the rate of absorption of oxygen by linseed oil after a period of inductance and the phenomenon of memory in connection with chemical changes in the brain cells (pp.

68 and 69). His conclusion that "perhaps the brain cells remember longest because they most carefully maintain intact, or preserve, these labrile autocatalytic substances" (p. 69), does not show necessarily either a materialistic or a panpsychic bias. The reader feels, however, Professor Mathews's very evident delight in the analogy and suspects more panpsychism than is admitted.

But be that as it may, Professor Mathews expresses himself in another instance in less dubious terms. In conclusion to the chapter on "The Master Tissue of the Body," he writes:

"We may close this chapter in no better way than in opening the question of the origin of the psychic qualities which are so related to the nervous system. Do these qualities arise *de novo* in the nervous system? Are they not found in their faintest form way down the slope of animal life? Do we not indeed see the beginnings of psychic life among the plants? And is it possible to start with the plants? Do not the foods every minute change into living matter in our bodies? Are not the atoms the same in the foods and living matter, and is it possible that they have different properties in the living and lifeless form? The atoms we know now are composed of electricity and the valences, or chemical bonds, are probably also electrical in nature. Are our thoughts also at bottom electrical? Whenever a nerve impulse sweeps over a nerve it is accompanied by an electrical disturbance, and this disturbance is the surest sign of life. When the nerve impulses play back and forth over the commissures of the brain they are accompanied by this pale lightning of the negative variation. Is that pale lightning what we recognize as consciousness in ourselves? It would seem that there must be some psychic element in every electron if the atoms are made of electrons. There must be some psychic disturbance in every union of hydrogen and oxygen to make water and in every wave of the wireless telegraph. When an electron moves it generates a magnetic field; does it also generate a psychic field? How shall we escape the conclusion that there must also be a psychic element in all matter both living and lifeless, since that matter is the same in the two forms? May it not be that just as magnetism, which is probably an attribute of all molecules, becomes most evident under certain conditions in certain substances, so the psychic life common to all matter shows its true character plainly only when organized as it is in the brain during its life? A magnet when heated loses its magnetism as surely as an organism when heated loses its vitality and its psychic life. In the case of magnetism all that has happened by the heating is that the orientation of the molecules has been changed so that the magnet is no longer an individual; in the case of the organism a similar loss of individuality results" (pp. 594–595).

Here once more we find the possibility of a materialistic interpretation of the position if we take literally the phrase "the pale lightning of the negative variation," while we find no less surely an equally plausible parallelistic interpretation by putting into prominence the sentence: "When an electron moves it generates a magnetic field; does it also generate a psychic field?"

It is apparent that Professor Mathews is caught in the old and artificial dilemma that consciousness is either a mental stuff or a form of energy. Neither view satisfies him and so he passes restlessly from one to the other and back again. Unfortunately he ignores the tendency so promising in modern psychology and philosophy to regard consciousness as neither mind stuff nor a form of energy, but as a mode of behavior. A consideration which evidently inclined Professor Mathews toward the older explanation of consciousness is voiced in a question which he asks rhetorically, but which I am inclined to accept as real: "Are not the atoms the same in the foods and living matter, and is it possible that they have different properties in the living and lifeless form?" It is evident that he believes that the first part of the question calls for an affirmative answer, and the second part for a negative. This is indeed a favorite argument for believers in mind stuff, and at first sight it seems but a corollary of the principle of evolution that complex forms of consciousness should come from simple forms. As actually employed it leads to a denial of novelty, to what James called "the block universe." Even, as James would say, while we hold in common with the goodly company of ancient scholastics and modern scientists that in regard to matter and energy it is certain that "*ex nihilo nihil fit,*" yet we must still insist that novelty of quality and novelty of behavior are only what is to be expected from novelty of organization. The sum of our distinctions between lifeless and living matter is precisely this, that living matter, because of certain new forms of organization, has new ways of behaving not possible to lifeless matter. When we make the further distinction between living matter and living matter which is also conscious, we notice still greater novelties in ways of behavior. The step from the merely living to the conscious is no less a step than from the lifeless to the living, for we pass hereby from a world causally controlled to a world where purpose enters.

We see a promising garden, for instance, beaten into the ground by a summer hailstorm, but the swallows in the midst of all this destruction are chattering under the eaves out of harm's way. The plants were killed, for they were unable to do more than suffer mechanically the dire effects of the pelting ice, but the birds, feeling

the discomfort of dampness and sharp blows, saw meaning in the eaves. They sought shelter, and to seek shelter means to follow a promise and to be controlled by a possible future. It is this difference of control which marks the entrance of conscious behavior upon the stage of the world.

It is then because Professor Mathews has ignored what is distinctive in conscious life that he has rendered consciousness quite unintelligible. This does not mean that students of philosophy who are intent upon the question of consciousness have not much to learn from a book of such scope as this. Only by working in conformity with established scientific facts in regard to the structure and functioning of the nervous system can they hope to make progress with the problem of consciousness. But the obligation is not entirely one sided. Such guesses as Professor Mathews has made in regard to consciousness should serve as a warning to his fellow scientists, that the nature of consciousness will never be revealed by a purely physiological or physiological-chemical analysis. Such an analysis when attempted seems to have less in common with scientific procedure than with the immortal adventure of "Hunting the Snark."

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The Essentials of Logic. R. W. SELLARS. Boston: Houghton, Mifflin Company. 1917. Pp. 343.

In many respects Professor Sellars's book has the merit of putting the subject-matter of logic before the student from the viewpoint of the present day. He has profited by recent discussions in his field, and has introduced in a profitable way not a few extracts from recent authorities. Another merit is the large number of fresh examples—often intrinsically superior. His style is clear, and often sententious and forceful. Among many excellent discussions may be noted the chapters on definition, fallacies (with the improved division of the subject), and hypotheses.

Pedagogically one finds ground for discontent. The author intimates that students have frequently asked him "whether logic is a practical subject." This inquiry—assuredly not an unreasonable one—is probably present, even when unexpressed, in all undergraduate logic classes. In the face of it, a wise exposition of the subject would seem to involve a representation of logical questions and principles as arising out of the needs of everyday life, and logical processes as simply extensions of ordinary thinking and critical improvements upon it. Such a course is not feasible, however, if, as in the book under review, argumentation occupies the first third or more of the treatment and is introduced by an abstract